REMARKS

This is in response to the Official Action currently outstanding with regard to the present application, which Official Action the Examiner has designated as being FINAL.

Claims 1, 3-13, 17 and 18 were pending in this application at the time of the issuance of the currently outstanding FINAL Official Action. By the foregoing Amendment, Applicants are herein proposing that Claims 1, 5, 6, 10, 17 and 18 be amended. Applicants are not proposing the cancellation, addition or withdrawal of any claims. Accordingly, in the event that the Examiner grants entry to the foregoing Amendment, Claims 1, 3-13 and 17-18 as amended hereinabove will constitute the Claims under active prosecution in this application.

The claims of this application are reproduced above including appropriate status identifiers and showing the Amendments proposed to be made as required by the Rules.

More particularly, in the currently outstanding Official Action the Examiner has:

1. Acknowledged Applicants' claim for foreign priority under 35 USC §119 (a)-(d) or (f), and confirmed the receipt of the required copies of the priority documents by the United States Patent and Trademark Office;

2. Objected to the drawings as filed with this application on 14 April 2004 on the grounds that Figs. 7 and 8 should be designated with a legend such as -- PRIOR ART – since only that which is old is depicted therein – **Applicants by the foregoing Request for Drawing Change Approval have presented both copies of the drawing sheets of this application that contain Figs. 7 and 8 whereon it is indicated in red that the legend -- PRIOR ART – is to be added to each of those Figures and also presented Replacement Drawing Sheets wherein the changes have been formally made.**

3. Provided Applicants with a Notice of References Cited (Form PTO-892).

4. Indicated that Applicants' previous arguments have been considered, but are deemed to be moot in view of the newly stated grounds for rejection.

5. Agreed that the cited art does not specifically teach the limitation of the equation of the pit to be less than the optical resolution capacity $\lambda/(4NA)$, but suggests that the Tominaga reference teaches one skilled in the art that a pit on a layer can achieve a higher resolution limit and that the pits can be shorter than the optical resolution limit.

6. Suggested that Applicants' comments concerning the orientation of the reading light beam are not relevant because there is no limitation concerning the same in the claims

7. Suggested that the protective layer and the substrate in the Tominaga reference are made of the same material and that one of ordinary skill in the art would attribute the functions of those layers to be the same

8. Rejected Claims 1 and 17 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as the invention because the phrase "a recording layer for reproducing a signal from the pits" is indefinite because the layer does not reproduce the pits, but rather the recording apparatus or optical system converts the pits to information and thereafter compounds his misquotation of the claim language by assuming that the phraseology in question means that the recording layer is provided with pits for the reproducing apparatus to reproduce.

9. Rejected Claims 1, 3, 5-12 and 17-18 under 35 USC 102 (b) as being anticipated by the Tominaga et al 5,569,517 reference

10. Rejected Claims 4 and 13 under 35 USC 103(a) as being unpatentable over the Tominaga reference in view of Jung 5,516,568.

At the outset of these Remarks, Applicants wish to thank the Examiner and his supervisor for the courtesy accorded to their undersigned representative during a telephone interview concerning this application that was held on 18 June 2008. During the course of that interview, proposed wording for the purpose of overcoming the currently outstanding rejection under 35 USC 112 and the scope and content of the primary Tominaga, et al reference as it applies to the present invention both were discussed. Unfortunately, however, no agreement was reached with the exception that it was agreed that Applicants would file this Amendment After Final Rejection under 35 USC 1.116. In the latter regard, it was contemplated that this Amendment After Final Rejection would provide the Examiner with the opportunity to consider Applicants' positions as refined since the interview discussion and to pass upon Applicants' request that the finality of the currently outstanding Official Action be withdrawn in view of the Examiner's apparent misconstruction of the wording of Claims 1 and 17 in the currently outstanding FINAL Official Action. In addition, it was Applicants' understanding that their argument that the protective layer and the substrate in the Tominaga et al reference are clearly not made of the same material as the Examiner has suggested also would be considered by the Examiner in response to this Amendment After Final Rejection..

No further comment regarding items 1-4 and 6 above is deemed to be required in these Remarks.

With respect to the currently outstanding rejections under 35 USC 112, Applicants by the foregoing Amendment are proposing that:

(1) the reproducing layer be described in the claims as "a reproducing layer for improving the resolution of optical signals from said pits and passing said improved resolution optical signals from said pits to said optical system; and

(2) the resolution limit be described in the claims as "a resolution limit of an optical system of a reproducing apparatus which reproduces that optical data recording medium.

It is Applicants' position that these amendments remove the bases for the currently outstanding rejections under 35 USC 112 not only because it is apparent that the Examiner apparently inadvertently misunderstood the nature of the reproducing layer (as being a recording layer) when he last examined the claims of this application, but also because the function of the reproducing layer is more clearly and definitively stated in the above amended claims than heretofore. Furthermore, the nature of the optical resolution limit set forth in the claims is clarified by the foregoing Amendment. The former of these changes is believed to be straightforward and to require no further discussion herein. The latter of these changes, on the other hand, is somewhat more complex.

As the Examiner's supervisor observed during the above-mentioned interview, it is difficult to define an apparatus in terms of the characteristics of another apparatus with which it is to be used. Nevertheless, Applicants respectfully submit that the nature of the recording/reproducing apparatus that is to record information to and./or reproduce information from a particular storage medium is an important characteristic of that apparatus. Heretofore during this prosecution Applicants no believe that they may have attempted to force descriptive limitations on this characteristic of the apparatus being claimed in a manner that caused more confusion than clarity. Accordingly, in the foregoing Amendment Applicants have adopted that approach that there is going to be a reproducing apparatus that characteristically will have a resolution limit that will appropriately record information to and reproduce information from a disk having pits of a particular dimension and that that device may be characterized simply as "a reproducing apparatus which reproduces the optical data recording medium" without the necessity of more specificity. Having determined that, it then becomes straightforward to define the reproducing layer in terms of its creation and passing of signals having improved resolution over that achieved by the basic reproducing apparatus.

Hence, Applicants respectfully submit that the foregoing simplified statement of the relationship between the storage medium and the recording/reproducing apparatus with which it is used is now clear, definite and clearly indicative of the Applicants' possession of the invention at the time that this application was filed. Furthermore, once this relationship is understood in the foregoing terms, Applicants respectfully submit that there can be absolutely no question that they have satisfied the enablement and best mode requirements of the statute as well.

Accordingly, Applicants respectfully request the entry of the foregoing Amendments and the withdrawal of any and all outstanding rejections under 35 USC 112 in response to this communication.

Turning now to the Examiner's outstanding substantive rejections, Applicants already have agreed that as has been suggested the Tominaga et al. reference, in Figures 1 and 2, shows pits 21 shorter than the diameter φ_o of a reading light beam. Nevertheless, Applicants also have submitted that this is insufficient to anticipate the feature of the amended claims that specifies "pits disposed on a light incident surface thereof, corresponding to the recorded data, which are shorter than a resolution limit of an optical system of a reproducing apparatus which reproduces the optical data recording medium" for the following reasons.

The beam spot diameter in devices of the type herein claimed is generally and conventionally denoted by those skilled in the art as λ/NA (λ: being the wavelength of read light beam, and NA being the numerical aperture). In contrast, the typical optical resolution limit is generally denoted by λ/(4NA), that is as being equal to one quarter (1/4) of the beam spot diameter. Accordingly, when one skilled in the art views the pits shown in Figures 1 and 2 of Tominaga et al. bearing the foregoing facts in mind, it clearly appears that the pits depicted by Tominaga et al are longer than the optical resolution limit referred to in the claims as discussed hereinabove. In this regard it also is to be recognized that the Tominaga et al. reference does not explicitly teach pits shorter than the resolution limit of an optical system of an associated reproducing apparatus.

Indeed, as was discussed during the above-referred to interview, the Examiner in the currently outstanding Official Action has admitted that the Tominaga reference does not teach that the pits are less than the optical resolution limit as calculated by $\lambda/(4NA)$, but nevertheless maintained that one of ordinary skill in the art would understand that Tominaga is teaching pits shorter than the normal optical resolution limit by inference from the sections at Column 2, lines 24-35 and Column 10, lines 7-20 of the Tominaga et al specification. Specifically, it is Applicants' undersigned representative's understanding that the Examiner has based the foregoing position upon an unsupported belief that the only variable that accounts for the changes in super resolution as discussed by the Tominaga et al reference is changes in pit length thereby making the presently claimed pit lengths inherent in the Tominaga et al disclosure. Applicants cannot agree.

In particular, it is Applicants' position that the Tominaga et al reference does not characterize the prior art referred to in the Background section of his specification in the manner referred to above because that art is different from and not relevant to the Tominaga Fig. 2 invention. Hence, while the materials referred to by Tominaga at Col. 2, lines 24-35 are suggested to achieve higher resolutions than the resolution limit of the associated optical system, those materials are different from the materials that Tominaga et al discusses with respect to his Fig. 2 and never quantify the length of the phase pits referred to as being optically read. Hence, Applicants respectfully submit that while Tominaga may indicate generally that reproducing layers are present in the art that can improve the resolution of information derived from pits in a substrate surface, nothing in Column 2, lines 24-35 of Tominaga is sufficient to anticipate the present invention because there is no disclosure, teaching or suggestion regarding the length of the so-called "phase pits" relative to the optical resolution limit of the optical system provided by the Tominaga et al reference in this (or indeed any) regard.

The same is respectfully submitted to be true with respect to the Examiner's comment that "super resolution is the ability to read an image beyond the diffraction limit resolution". In other words, without any specification teaching, disclosing or suggesting the specific quantitative relationship between the optical system resolution and the length of the pits, it is not possible to justify a position that the Tominaga et al reference ***anticipates the present claims that do specify the quantitative relationship not disclosed by Tominaga, et al.***

In this regard as well, Applicants respectfully submit that it should be recognized that the Tominaga et al reference specifically refers only to a ***suggestion*** that the results of at least one of the experiments described in his specification is that a higher resolution is achievable with a material that changes its reflectance with temperature. Applicants respectfully submit that the latter comment by Tominaga et al, even if true, is not sufficient to justify the expansive conclusions concerning the relationships between pit length and optical system resolution that the Examiner has chosen to draw from it. Hence, Applicants respectfully submit that neither of the portions of the Tominaga et al reference referred to by the Examiner is sufficient to constitute a reduction to practice by Tominaga, et al of the super resolution disclosed and claimed in this application and further that accordingly the Examiner has not justified a conclusion of anticipation based thereon.

Moreover, Applicant respectfully submits that Tominaga et al does not inherently teach, disclose or suggest to one skilled in the art that so-called "super resolution" technology delivers a desired performance when the length of the pits that are the signal source are at or below the optical resolution limit of the associated optical system. The Tominaga et al reference's broad and generalized suggestion that it achieves a higher resolution limit than the optical resolution limit of the associated optical system ***does not*** constitute a teaching, disclosure or suggestion that that higher resolution limit originates ***only and/or necessarily*** with signals reproduced from pits shorter than the resolution limit of the optical system.

Indeed, as will be shown below, the length of the pits from which the signal originates in so-called "super resolution" technology wherein a higher resolution limit than the resolution limit of the optical system is achieved in fact can be longer, as well as shorter, than the optical resolution limit of the associated optical system.

Hence, while the Tominaga et al reference may suggest that it obtains a higher resolution than the optical resolution of its associated optical system, that suggestion alone and taken only in and of itself ***cannot*** be taken as a disclosure that the Tominaga results are achieved with pit lengths shorter (or for that matter longer) than the optical resolution of the associated optical system. In other words, it is Applicant's position that while the broad and general overall concept of super resolution may be present to some limited extent in Tominaga et al disclosure, the Tominaga et al disclosure nevertheless is clearly totally insufficient to teach, disclose or suggest whether its results are achievable with pits that are shorter and/or longer than the optical resolution of the associated optical system because none of those quantitative measurements is contained in the Tominaga et al disclosure. Thus, the Tominaga et al disclosure is respectfully submitted to be insufficient to teach or disclose to one of ordinary skill in the art what the lengths of the pits should be in order to achieve "super resolution". In other words, the Tominaga et al specification could not qualify as a reduction to practice of the present invention because it provides no specifics concerning the length of the pits relative to the optical resolution length at all.

On the other hand, Applicants respectfully call attention to the fact that the present invention teaches unequivocally and specifically that the pit length should be shorter than the optical resolution of the associated optical system when "super resolution" is achieved.

Furthermore, as the following analysis shows, the pit length in some super resolution technologies can be longer than the optical resolution when "super resolution" is achieved thereby rendering the Examiner's "inherent teaching" basis for the currently outstanding rejections in the currently outstanding rejections untenable.

In actuality, as the mark (i.e., pit) length approaches the optical resolution limit in an ordinary optical information storage medium one cannot obtain the strength (ex. C/N) of signals reproduced from marks longer than the optical resolution limit. The technology that improves the signal strength from such marks, even if the marks are longer than the resolution limit, is sometimes described as "super resolution. See, for example, Attachment I hereto dealing with magnetically induced super resolution and the following analysis that shows that the mark (i.e., pit) lengths in the disclosed magnetically induced super resolution context are ***longer than the optical resolution limit.***

Consequently, Applicants respectfully submit that the Tominaga et al reference is insufficient to teach, disclose or suggest what the length of the pits should be in a system that achieves "super resolution" despite the Examiner's attempt to impute some sort of inherent disclosure to the Tominaga et al reference that is respectfully submitted to not really be there.

Analysis of Attachment I (magnetic super resolution) in comparison to Blu-Ray Disc of Attachment II

In support of Applicants' assertion that the pit length can be ***longer than the optical resolution of the optical system*** in some cases wherein so-called super resolution is achieved, Applicants respectfully direct attention to attachments I and II which may be identified as follows:

1. Proc. SPIE 4342,252 (2002) 50-mm CAD-MSR Disk System with Blue Laser, Y, Murakami, et al – Attachment I

2. "New Anatomy of Next –generation Optical Discs: In-depth Analysis (with partial English language translation of relevant sections) – Attachment II

The minimum mark length described in Document 1 (that describes magnetically induced super resolution) above can be calculated through a comparison with Document 2 above as follows:

The Abstract of Document 1 specifically indicates that it relates to a super resolution medium.

Document 1 at page 253, Fig. 1 explains track pitch while Document 2 illustrates the track pitch for a Blue Ray Disc

Document 1 at Table 1 on page 256 states a reproduction wavelength of 406 nm, a NA of 0.60, a recording format as land/groove and a modulation code of (1,7) RLL. Further, at page 258 of Document 1 a recording density of 11 Gbit/in^2 is disclosed.

Document 2, on the other hand, at page 26 indicates a recording density of 18 Gbit/in^2, a minimum mark length of 0.149 μm and a modulation code of 1-7PP (the same as (1,7) RLL) at 25-Gb BD.

ANALYSIS

The storage capacity, Q, for one revolution at radius r from the center of a disc is

$Q = C \times 2\pi r/L$

Where $2\pi r$ is the circumference, while L is the minimum mark length and ***C is a constant determined by the modulation code***. The area S of the data recording region located at radius r is given by

$S = 2\pi r \times P$

Where P is the recording pitch.

Hence, the recording density D for the revolution is given by

$D = Q/S = C \times 2\pi r/L/(2\pi r \times P) = C/(L \times P)$

Assuming the density D1 is the minimum recording density, the minimum mark (i.e., pit) length is L1, the recording pitch is P1 and the constant C1 is associated with document 1, while with regard to the structure of document 2 the density D2, the minimum mark length is L2, the recording pitch is P2 and the constant is C2

$D1 = C1/(L1 \times P1)$ and $D2 = C2/(L2 \times P2)$

The modulation codes for Document 1 and Document 2 are equal which means that:

$C1 = C2$

Thus, when one substitutes the values from documents 1 and 2 into the foregoing:

$D1 = 11$ Gbits/in^2 (page 258 of Document 1)

$P1 = 0.40\mu m$ – Since the recording scheme attached to document 2 is 'groove recording" (see Table 1) Recording Pitch P2 = Groove Width + Land Width. In contrast, the recording scheme of document 1 is "land/groove recording (see Table 1) and Recording Pitch P1 = groove Width = Land Width.

Then:

For the structure of Document 2

$D2 = 18$ Gbits/in^2

$P2 = 0.32$ μm

$L2 = 0.149$ μm (see Table 1)

Accordingly:

Since $C1 = C2$

$L1 = C1/(D1 \times P1) = D2 \times (L2 \times P2)/(D1 \times P1) = 0.195$ μm (well in excess of the minimum mark length $L2 = 0.149$ μm

Clearly, therefore, if both the discs of Document 1 and Document 2 are read by the same optical system and L1 is equal to the minimum optical resolution of the optical system, the disk of Document 2 has a minimum mark length in excess of the optical resolution of that optical system, yet both the discs of Document 1 and Document 2 can in appropriate contexts exhibit super resolution behaviors.

Note: The recording scheme attached to document 2 is 'groove recording" (see Table 1) Recording Pitch P2 = Groove Width + Land Width. In contrast, the recording scheme of document 1 is "land/groove recording (see Table 1) and Recording Pitch P1 = groove Width = Land Width

In contrast to the foregoing, the present specification, at page 39, last paragraph to page 40, paragraph. 3, clearly describes the use of pits < 0.14 μm, that is shorter than the optical resolution limit, in securing sufficient signal quality (optical resolution limit: 0.16 μm = 408 nm / (4 x 0.65). In particular support of this assertion, please see the present specification at page 39, paragraph. 2.

Accordingly, Applicants respectfully submit that the Examiner's rejection of the present application as being anticipated by the Tominaga et al reference is misplaced and should be withdrawn in response to this communication. A decision so holding is respectfully requested.

Moreover, Applicants have noted that in comparing Claim 1 of the present application with the Tominaga et al reference, the Examiner has asserted that the protective layer 10 of Tominaga et al. corresponds to the substrate of claim 1. See the currently outstanding Official Action at page 3 in the paragraph starting with "Regarding Claim 1. It is to be noted in this regard, however, that Tominaga et al. includes a substrate 2 separately from the protective layer 10. Applicants respectfully submit in this regard that it is the substrate 2 that the Examiner should regard as corresponding to the substrate of claim 1 in his comparisons of the present claims with the Tominaga et al reference and that when the correct comparison is made in view of the foregoing discussion it is apparent that this application is neither anticipated nor unpatenatably obvious over the art currently relied upon by the Examiner.

In the latter regard, Applicants respectfully submit that in the field of the optical data recording mediums it is so well known as to require no further support in these Remarks that what is termed as being a "substrate" is clearly distinct from what is termed as "protective layer".

Therefore, Applicants respectfully submit that it will be seen that the Examiner continues to characterize both the elements 10 and 21 of FIG. 2 of the Tominaga reference relied upon as being " a substrate having pits". However, the substrate is clearly indicated at 2 and the pits are clearly indicated at 21 (see Tominaga at Column 4, lines 18-22). Further, there is no indication that irregularities depicted in the drawings on the inwardly facing surface of the protective layer 10 in any way are (or can be) used to store information in a manner analogous to that utilized with respect to the pits. Still further, contrary to the Examiner's assertion, it appears that while the substrate 2 and the protective layer 10 are to be formed of less heat resistant resins than the mask layer 32 and can be deformed (see Tominaga et al at Column 7, lines 44-47), ***the substrate and the protective layer are not disclosed as being formed of the same material as the Examiner has suggested in the currently outstanding Official Action.***.

In summary, therefore, Applicants respectfully submit that the foregoing Amendments, if granted entry by the Examiner, overcome the currently outstanding rejections under 35 USC 112 and therefore at least place those claims in better condition for Appeal if not in condition for allowance as required by 37 CFR 1.116. Also, Applicants respectfully submit that upon reconsideration in view of the foregoing Amendment and Remarks the Examiner will realize that while the Tominaga et al reference upon which he has relied may be generally relevant to the presently claimed invention, it is simply insufficient to justify the anticipatory conclusions that he has seen fit to derive from it.

Hence, for each and all of the foregoing reasons, entry of the foregoing Amendment, withdrawal of the currently outstanding FINAL rejection, reconsideration and allowance of all of the claims present in this application after the entry of this Amendment in response to this communication are respectfully requested.

Applicant also believes that additional fees beyond those submitted herewith are not required in connection with the consideration of this response to the currently outstanding Official Action. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge and/or credit Deposit Account No. 04-1105, as necessary, for the correct payment of all fees which may be due in connection with the filing and consideration of this communication.

Respectfully submitted,

Date: 3 July 2008

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